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(19) Europäisches Patentamt
European Patent Offic
Office européen des brevets

(11) Publication number: **0 308 976 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication of patent specification: **02.01.92**

(51) Int. Cl.[5]: **C01B 3/34**, B01J 8/02

(21) Application number: **88115740.8**

(22) Date of filing: **23.09.88**

(54) **Plate type reformer.**

(30) Priority: **25.09.87 JP 145404/87**

(43) Date of publication of application:
29.03.89 Bulletin 89/13

(45) Publication of the grant of the patent:
02.01.92 Bulletin 92/01

(84) Designated Contracting States:
DE GB IT NL

(56) References cited:
JP-A-62 027 305
JP-A-62 160 134
JP-A-62 160 135
JP-A-62 160 136

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EP 0 308 976 B1

Description

This invention relates to a reformer where fuel gas (raw material gas) is reformed to product gas and supplied to anodes (fuel electrodes) of cells in fuel cell systems, in particular, and relates to a plate type reformer where reforming reaction is conducted while the fuel gas is indirectly heated by burning gas which is supplied to cathodes (air electrodes) of the cells.

A fuel cell system is an electricity generating system using reversed electro-chemical reaction of an electrolysis of water in electrolytes including carbonates, phosphorates, etc., with hydrogen gas being supplied to anodes (fuel electrodes) and burning gas (O_2, CO_2) to cathodes (air electrodes) in the cells.

The hydrogen gas, which is supplied to the anode, is obtained by supplying fuel gas, such as methane, as raw material gas with the steam to the reformer, in accordance with reforming reaction which is given by the following chemical equation with catalysts:

$$CH_4 + H_2O \rightarrow CO + 3H_2$$
$$CO + H_2O \rightarrow CO_2 + H_2$$

To maintain the reforming temperature in the reformer, remaining hydrogen or carbon monoxide in the anode gas is supplied to the reformer and burned there to heat up indirectly the fuel gas to be reformed.

In such a reformer, however, air and fuel flow into a combuster of the reformer to be burned together, so that volume of the combuster has to b large, and the reformer is often too large in size. The temperature of the burnt gas is as high as 1300 degrees C until heat is transferred to the reforming gas and it is structurally impossible to decrease the temperature of the burnt gas in order to match the temperature of the heat receiving gas (between 550 and 750 degrees C).

To solve these problems, plate type reformers which are compact in size, and in which uniform combustion all over the combustor is possible to achieve effective reforming, were recently proposed (see for example, Japanese Patent Application Laid Open No. 160136/1987).

A primary object of this invention is to provide a plate type reformer which enables an effective h at exchange between the burning gas and a raw material gas to be reformed at a lower temperature as hereinbefore possible.

A further object of this invention is to provide a plate type reformer which enables uniform fuel supply to the combustor as well as step-by-step combustion.

This invention provides a plate type reformer comprising plural main units which include a combustor filled with a combustion catalyst and a reforming reactor filled with a reforming catalyst, piled together with a heat conductive separator between the combustor and the reactor, and plural auxiliary units to supply fuel to the combustors of the respective main units.

Further this invention provides a plate type reformer in which the combustor-side surfaces of the main units face each other, sandwiching an auxiliary unit therebetween, thus the main units and the auxiliary unit are piled together, and this pile has a passage to supply air for combustion to the above-mentioned combustor, a passage to exhaust burnt gas from the combustor, a passage to supply the raw material gas to be reformed into the reforming reactor, a passage to draw off the reformed gas, and a passage to supply fuel to the above-mentioned distance plate.

The invention will be further described with reference to the drawings in which

Fig. 1
is a perspective view showing a part of an embodiment of this invention prior to assembling thereof;

Fig. 2
is a cross sectional view of Fig. 1 as assembled;

Fig. 3 and Fig. 4
illustrate temperature distributions of combustion gas and reforming gas between the inlet and the outlet of the reforming reactor during heat exchange, respectively;

Fig. 5
is a cross section view of another embodiment at its central part.

As described in Fig. 1 and Fig. 2, a single segment of a plate type reformer of this invention mainly comprises two main units I, in which a reforming reaction and a combustion take place, and one auxiliary unit II, through which fuel for combustion is supplied to the main units I, with the auxiliary unit sandwiched by the main units I, and the main units I being symmetrical to each other. Holders 10 and 12 are located on the exposed sides of the main units I, respectively.

The main unit I includes a reforming plate 14 in which a reforming reactor 16 is provided, a combustion plate 18 in which a combustor 20 is provided, and a heat conductive separator or a heat conductive partition wall 22 located between two plates 14 and 18. A central portion of the reforming plate 14 is hollowed out and the hollow or space 16a is filled with a reforming catalyst 24 so as to form the reforming r actor 16. Similarly to the reforming plate, a central portion of th combustion plate 18 is hollowed out, and the hollow 20a defined within the combustion plate 18 is filled with a combustion catalyst 26 so as to form the combus-

tor 20.

The auxiliary unit II compris s a distance plate 30 which has a scooped space 28, and two dispersion plates 34 which have a plurality of pores 32 to supply fuel from the scooped space 28 to the combustors 20 in the main units I, with the dispersion plates being stacked onto the distance plate.

In the pile of these main units I and the auxiliary unit II, the combustion plates 18 of the main units I are located to contact with the upper and lower dispersion plates 34 of the auxiliary unit II, respectively. The upper holder 10 and the lower holder 12 for the sandwich of the upper main unit I, the auxiliary unit II, and the lower main unit I are fastened by bolts and nuts, or the like (not shown).

The upper holder 10 has an inlet opening 36 for raw material gas to be reformed (CH_4 + H_2O), and an outlet opening 38 for the reformed gas (H_2, CO_2). The inlet 36 communicates with the reforming reactor 16 in the reforming plate 14 located thereunder, and the raw material gas to be reformed is supplied to the reforming reactor 16 in the lower main unit I through bores 40 formed within the partition plate 22, the combustion plate 18, the dispersion plate 34, and the distance plate 30. The gas so reformed flows through openings 42 formed within the partition plate 22, the combustion plate 18, the dispersion plate 34, and the distance plate 30 so that it encounters the gas reformed in the reforming reactor 16 in the upper main unit I and proceeds to the outlet opening 38 at the upper holder 10.

The lower holder 12 has an air inlet 44, a fuel inlet 46, and a burnt gas outlet 48. Air through the air inlet 44 is supplied to the combustion chamber 20 in the combustion plate 18 through openings 50 provided in the reforming plate 14 and the separator 22 of the lower main unit I, and then from that combustion chamber 20 the air is supplied to another combustion chamber 20 in the upper main unit I through openings 50 of the upper and lower dispersion plates 34 and the distance plate 30.

Fuel through the fuel inlet 46 is supplied to the scooped space 28 of the distance plate 30 via openings 52 bored within the reforming plate 14, the partition plate 22, the combustion plate 18, and the dispersion plate 34 of the lower main unit I.

Exhaust gas generated in the combustor 20 in the upper main unit I flows through holes 54 formed in the dispersion plates 34 and the distance plate 30 and encounters the exhaust gas generated upon combustion in the combustion chamber 20 of the low r main unit I. Aft r that, thos exhaust gases are discharged from an exhaust opening 48 through holes 54 provided in th lower partition plate 22 and in the lower reforming plate 14.

In th above-mentioned system, air is supplied through the air inlet 44 whil fuel is supplied through the fuel inlet 46 in the lower holder 12, and raw material gas to b reformed (CH_4 + H_2O) is supplied through the gas inlet 36 in the upper holder 10.

The air flows from the air inlet 44 through the holes 50 into the combustors 20 in the upper and lower main unit I. The fuel flows into the scooped space 28 in the distance plate 30 from the fuel inlet 46 of the lower holder 12, through the fuel passage 52 of the main unit I, and then the fuel flows out of the scooped space 28, proceeding through the pores 32 of the upper and lower dispersion plates 34 into the upper and lower combustors 20 next to the dispersion plates 34. The fuel is burned with the combustion catalyst 26 in the combustors 20, and the resulting exhaust gas is discharged from the exhaust gas outlet 48 of the holder 12 through the holes 54.

On the other hand, the raw material gas to be reformed and supplied from the inlet 36 of the upper holder 10 flows into the reforming reactor 16 of the upper main unit I, and a part of the gas further flows into the reforming reactor 16 of the lower main unit I through the holes 40. This fuel gas is heated by the gas which has been burned in the combustor 20 and reaches the reaction chamber 16 through the separator 22, and is reformed to H_2 and CO_2 with the reforming catalyst 24 in the reforming chamber 16. The gas thus reformed is delivered outside the unit from the reformed gas outlet 38 of the upper holder 10 via the openings 42.

In the reforming process mentioned above, this system can be made compact because the reforming reactor 16 is located adjacent to the combustor 20 with the separator 22 disposed between the reforming reactor 16 and the combustor 20 so that the reforming reactor 16 may be heated up by the burned gas generated in the combustor 20.

Since the fuel flows through the scooped space 28 of the distance plate 30 and the pores 32 of the dispersion plate 34, it spreads uniformly throughout the combustor 20, and the combustion of the fuel takes place gradually or step by step, lowering the combustion temperature compared with conventional systems. It is possible to adjust the combustion temperature required by the heat receiving gas, by controlling the size and the pitch of the pores 32 in the dispersion plate 34.

Fig. 3 and Fig. 4 depict temperature distribution curves of burnt gas and heat-receiving reformed gas between the entrance and the exit of th reforming reactor and combustor, in which "X" indicates a temperature distribution curv of combusted gas, and "Y" indicates the distribution curve of the gas reformed according to the present invention while "Z" is the temperatur distribution curv of the gas combustion in a conventional system.

Fig. 3 depicts distribution curves of the case where the heat exchange between combusted gas and heat receiving (reforming) gas is performed by parallel gas flow (co-flow), and Fig. 4 depicts the case of counter flow. As indicated by the curve Z, the temperature of the combusted gas in the conventional system is as high as 1300°C at the entrance while, according to the present invention, the burned gas temperature is 650°C at the entrance and 850°C at the exit as illustrated by the temperature distribution curve X. This means that a lower temperature can be used in the present invention.

Fig. 5 shows another embodiment of the present invention. This embodiment, basically identical with the example illustrated in Figs. 1 and 2, has two porous plates 60, each contacting to the combustor 20 side of dispersion plate 34 of the auxiliary unit II. In this example, the function of the porous plate 60 is to further disperse the fuel flowing into the combustor 20 from the pores 32 of the dispersion plate 34. In other words, if the size and the pitch of the pores 32 in the dispersion plate 34 are determined so as not to be affected by pressure fluctuation of the fuel, the pitch becomes too large and a uniform fuel dispersion is difficult to realize. In such a case, the porous plate 60 effectively serves to make the fuel much finer.

The present invention is not restricted to the above-mentioned examples but, for instance, the positions of the passages for air, fuel, etc. and of each inlet/outlet opening for fuel, the reformed gas, tc., may be changed from the positions shown in the figures. The numbers of layers of the main unit may be more than two, and accordingly, the number of auxiliary units will be increased.

Claims

1. A reformer including a reforming reactor (16) in which a raw material gas undergoes a reforming reaction in the presence of a catalyst and fuel gas is burned so that the reforming reaction temperature may be maintained at a proper level, and the burnt gas may indirectly heat the raw material gas in the reforming reactor (16); **characterized** in that said reformer comprises: a plurality of main units (I), each main unit (I) including a combustor (20) filled with combustion catalyst (26) and a reforming reactor (16) filled with reforming catalyst (24) with a heat conductive partition wall (22) being sandwiched between the combustor (20) and the reforming reactor, (16); an auxiliary unit (II), including a distance plate (30) which has a vacant fuel chamber (28); and two porous plates (34) sandwiching the distance plate (30), the porous plates (34) serving as fuel distribution plates for uniformly supplying the fuel into each combustor (20) of each main unit (I), whereby the reforming reactors (16) of the main units (I) are equally heated, the combustors (20) of the main units (I) facing each other so as to sandwich the auxiliary unit (II) between the main units (I); an air passage (44, 50) for supplying air to said combustor (20); an exhaust passage (48, 54) for discharging the gas burned in said combustor (20); a fuel gas passage (36, 40) for supplying fuel gas for reforming to the reforming reactor (16); a gas discharge passage (42, 38) for discharging the gas which is reformed; and a fuel passage (46, 52) for supplying the fuel to said fuel chamber (28), all the passages (36, 38, 40, 42, 44, 46, 48, 50, 52, 54) being formed within the main and auxiliary units (I, II).

2. The reformer of claim 1, **characterized** in that the main units (I) are located on both sides of the auxiliary unit (II) in a way that the combustor (20) of each main unit (I) faces the auxiliary unit (II), and two holders (10, 12) are provided at the exposed sides of the main units (I), so that all the units (I, II, I) between the holders (10, 12) are piled together as a single unit.

3. The reformer of claim 1 or 2, **characterized** in that the main unit (I) includes a reforming plate (14) in which the reforming reactor (16) is formed, a combustion plate (18) in which the combustor or a combustion chamber (20) is formed, and a heat conductive partition plate (22) which is sandwiched between the reforming plate (14) and the combustion plate (18).

4. The reformer of claim 3, **characterized** in that the reforming reactor (16) includes the reforming plate (14) which is hollowed out at the center thereof, the hollowed space (16a) being filled with the reforming catalyst (24).

5. The reformer of claim 3 or 4, **characterized** in that the combustor (20) includes the combustion plate (18) whose central portion is hollowed out, the hollowed space (20a) being filled with the combustion catalyst (26).

6. The reformer of any one of the foregoing claims, **characterized** in that the auxiliary unit (II) includes a distance plate (30) which has a scooped space (28) that serves as a fuel supply chamber (28), and two disp rsion plates (34, 34) disposed on both sides of the distance plate, a plurality of pores being formed in the dispersion plate (34) so that fuel is supplied therethrough from th fuel chamb r (28) to the

combustor of the adjacent main unit (I).

7. The reformer of claim 6, **characterized** in that the main unit (I) is stacked in a manner such that the combustor (20) of the main unit (I) may be located adjacent to the dispersion plate (34), and that a holder (10, 12) is mounted on the reforming reactor (16) side of the main unit (I) so that all the units (I, II, I) may be piled as a sing a element.

8. The reformer of claim 7, **characterized** in that the raw material gas inlet (36) and the reformed gas outlet (38) are formed in one holder (10), and that supply and discharge passages (40, 42) for raw material gas to be reformed and for the reformed gas are formed in the heat conductive partition wall (22), in the combustion plate (18), in the distance plate (30) and in the dispersion plate (34) of the auxiliary unit (II).

9. The reformer of claim 7, **characterized** in that the inlet openings (44, 46) for combustion air and fuel gas, and the outlet opening (48) for the combusted gas are formed in the other holder (12), that a supply passage (50) for combustion air and a discharge passage (54) for the exhaust gas are formed in the heat conductive partition wall (22), in the reforming plate (14), in the distance plate (30) and in the dispersion plate (34) of the auxiliary unit (II), and that a supply passage (52) is formed in the combustion plate (18), in the heat conductive partition wall (22), in the reforming plate (14), and in the dispersion plate (34) of the auxiliary unit (II), so as to allow the fuel gas to flow into the scooped space (28) of the distance plate (30).

10. The reformer of claim 6, **characterized** in that a porous plate (60) is provided on the combustor (20) side of the dispersion plate (34) in the auxiliary unit (II).

Revendications

1. Reformeur comprenant un réacteur (16) de reformage dans lequel une matière gazeuse brute subit une réaction de reformage en présence d'un catalyseur et un gaz combustible est brûlé afin que la température de la réaction de reformage puisse être maint nue à un niv au approprié, et que l gaz brûlé puisse chauffer indirectement la matière gazeuse brute dans le réacteur (16) de reformage ; caractérisé en c que ledit reformeur comporte : plusieurs unités principales (I), chaqu unité principale (I) comprenant un élément de combustion (20) rempli d'un catalyseur (26) de combustion et un réacteur (16) de reformage rempli d'un catalyseur (24) de reformage, une cloison (22) conductrice de la chaleur étant prise en sandwich entre l'élément (20) de combustion et le réacteur (16) de reformage ; une unité auxiliaire (II) comprenant une plaque d'écartement (30) qui présente une chambre libre (28) à combustible ; et deux plaques poreuses (34) prenant en sandwich la plaque d'écartement (30), les plaques poreuses (34) servant de plaques de distribution de combustible pour introduire uniformément le combustible dans chaque élément (20) de combustion de chaque unité principale (I), de manière que les réacteurs (16) de reformage des unités principales (I) soient chauffés de façon égale, les éléments de combustion (20) des unités principales (I) se faisant face mutuellement afin de prendre en sandwich l'unité auxiliaire (II) entre les unités principales (I) ; un passage d'air (44, 50) pour amener de l'air audit élément (20) de combustion ; un passage d'échappement (48, 54) destiné à décharger le gaz brûlé dans ledit élément (20) de combustion ; un passage (36, 40) de gaz combustible pour amener du gaz combustible pour le reformage au réacteur (16) de reformage ; un passage (42, 38) de décharge de gaz destiné à décharger le gaz qui est reformé ; et un passage (46, 52) de combustible destiné à amener le combustible à ladite chambre (28) à combustible, tous les passages (36, 38, 40, 42, 44, 46, 48, 50, 52, 54) étant formés à l'intérieur des unités principales et auxiliaire (I, II).

2. Reformeur selon la revendication 1, caractérisé en ce que les unités principales (I) sont placées sur les deux côtés de l'unité auxiliaire (II) de manière que l'élément (20) de combustion de chaque unité principale (I) soit face à l'unité auxiliaire (II), et deux éléments de maintien (10, 12) sont prévus sur les côtés à découvert des unités principales (I), afin que toutes les unités (I, II, I) entre les éléments de maintien (10, 12) soient empilées ensemble en un seul bloc.

3. Reformeur selon la revendication 1 ou 2, caractérisé en ce que l'unité principale (I) comprend une plaque (14) de reformage dans laquelle est formé le réacteur (16) de reformage, une plaqu (18) de combustion dans laquelle est formé l'élément de combustion ou une chambre de combustion (20), et une plaque de cloisonnement (22) conductrice de la chaleur qui est prise en sandwich entr la plaque (14) de reformage et la plaque (18) de combustion.

4. Reformeur selon la revendication 3, caractérisé en ce que le réacteur (16) de reformage comprend la plaque (14) de reformage qui est évidée en son centre, l'espace évidé (16a) étant rempli du catalyseur (24) de reformage.

5. Reformeur selon la revendication 3 ou 4, caractérisé en ce que l'élément (20) de combustion comprend la plaque (18) de combustion dont la partie centrale est évidée, l'espace évidé (20a) étant rempli du catalyseur (26) de combustion.

6. Reformeur selon l'une quelconque des revendications précédentes, caractérisé en ce que l'unité auxiliaire (II) comprend une plaque d'écartement (30) qui présente un espace excavé (28) qui sert de chambre (28) d'alimentation en combustible, et deux plaques de dispersion (34, 34) disposées sur les deux côtés de la plaque d'écartement, plusieurs pores étant formés dans la plaque de dispersion (34) afin qu'un combustible soit amené à travers elle de la chambre (28) de combustible à l'élément de combustion de l'unité principale adjacente (I).

7. Reformeur selon la revendication 6, caractérisé en ce que l'unité principale (I) est empilée d'une manière telle que l'élément (20) de combustion de l'unité principale (I) puisse être placé à proximité immédiate de la plaque (34) de dispersion, et en ce qu'un élément (10, 12) de maintien est monté sur le côté réacteur de reformage (16) de l'unité principale (I) afin que toutes les unités (I, II, I) puissent être empilées en un élément unique.

8. Reformeur selon la revendication 7, caractérisé en ce que l'entrée (36) de matière gazeuse brute et la sortie (38) de gaz reformé sont formées dans un élément de maintien (10), et en ce que les passages (40, 42) d'amenée et de décharge pour la matière gazeuse brute à reformer et pour le gaz reformé sont formés dans la paroi de cloisonnement (22) conductrice de la chaleur, dans la plaque (18) de combustion, dans la plaque (30) d'écartement et dans la plaque (34) de dispersion de l'unité auxiliaire (II).

9. Reformeur selon la revendication 7, caractérisé n ce que les ouvertures (44, 46) d' ntrée pour l'air comburant et le gaz combustible, et l'ouverture (48) d sortie pour les gaz brûlés sont formées dans l'autre élément (12) de maintien, en ce qu'un passage (50) d'amenée pour l'air comburant et un passage (54) de décharge pour le gaz d'évacuation sont formés dans la paroi (22) de cloisonnement conductrice de la chaleur, dans la plaque (14) de reformage, dans la plaque (30) d'écartement et dans la plaque (34) de dispersion de l'unité auxiliaire (II), et en ce qu'un passage (52) d'amenée est formé dans la plaque (18) de combustion, dans la paroi (22) de cloisonnement conductrice de la chaleur, dans la plaque (14) de reformage et dans la plaque (34) de dispersion de l'unité auxiliaire (II), afin de permettre au gaz combustible de s'écouler jusque dans l'espace excavé (28) de la plaque d'écartement (30).

10. Reformeur selon la revendication 6, caractérisé en ce qu'une plaque poreuse (60) est prévue sur le côté élément de combustion (20) de la plaque (34) de dispersion dans l'unité auxiliaire (II).

Patentansprüche

1. Reformer mit einem Reformierreaktor (16), in dem ein Vormaterialgas eine Reformierreaktion in Anwesenheit eines Katalysators erfährt und Brennstoffgas verbrannt wird, so daß die Reformierreaktionstemperatur auf einem geeignetem Pegel gehalten werden und das verbrannte Gas das Vormaterialgas in dem Reformierreaktor (16) indirekt aufheizen kann, dadurch **gekennzeichnet**, daß der Reformer umfaßt: eine Anzahl Haupteinheiten (I), von denen jede einen Brennraum (20) gefüllt mit Verbrennungskatalysator (26) und einen Reformierreaktor (16) gefüllt mit Reformierkatalysator (24) enthält, wobei eine wärmeleitfähige Teilungswand (22) zwischen dem Brennraum (20) und dem Reformierreaktor (16) angeordnet ist; eine Hilfseinheit (II) mit einer Distanzplatte (30) mit einer leeren Brennstoffkammer (28); und zwei poröse Platten (34), zwischen denen die Distanzplatte (30) liegt und die als Brennstoffverteilungsplatten zum gleichmäßigen Zuführen des Brennstoffs in jeden Brennraum (20) einer jeden Haupteinheit (I) dienen, wodurch die Reformierreaktoren (16) der Haupteinheiten (I) gleichartig erwärmt werden und die Brennräume (20) der Haupteinheiten (I) einander gegenüber stehen, so daß die Hilfseinheit (II) zwischen den Haupteinheiten (I) liegt; einen Luftkanal (44, 50) zum Zuführen von Luft zu dem Brennraum (20); einen Abgaskanal (48, 54) zum Abführen des in dem Brennraum (20) verbrannten Gases; ein n Brennstoffgaskanal (36, 40) zum Zuführen von Brennstoffgas für das Reformieren in den Reformierreaktor (16); einen Gasabführungskanal (42, 38) zum Abführen des reformiert n Gases; und einen Brenn-

stoffkanal (46, 52) zum Zuführen des Brennstoffs in die Brennstoffkammer (28), wobei alle Kanäle (36, 38, 40, 42, 44, 46, 48, 50, 52, 54) in den Haupt- und Hilfseinheit n (I, II) ausgebildet sind.

2. Reformer nach Anspruch 1, dadurch **gekennzeichnet**, daß die Haupteinheiten (I) auf den beiden Seiten der Hilfseinheit (II) so angeordnet sind, daß der Brennraum (20) jeder Haupteinheit (I) der Hilfseinheit (II) zugewandt ist, und daß zwei Halter (10, 12) an den freiliegenden Seiten der Haupteinheiten (I) vorgesehen sind, so daß alle Einheiten (I, II, I) zwischen den Haltern (10, 12) als eine einzige Einheit zusammengefaßt sind.

3. Reformer nach Anspruch 1 oder 2, dadurch **gekennzeichnet**, daß die Haupteinheit (I) eine Reformierplatte (14), in der der Reformierreaktor (16) ausgebildet ist, eine Verbrennungsplatte (18), in der der Brennraum oder eine Brennkammer (20) ausgebildet ist, und eine wärmeleitfähige Teilungsplatte (22) zwischen der Reformierplatte (14) und der Verbrennungsplatte (18) enthält.

4. Reformer nach Anspruch 3, dadurch **gekennzeichnet**, daß der Reformierreaktor (16) die Reformierplatte (14) enthält, die in ihrer Mitte ausgehöhlt ist, wobei der ausgehöhlte Raum (16a) mit dem Reformierkatalysator (24) gefüllt ist.

5. Reformer nach Anspruch 3 oder 4, dadurch **gekennzeichnet**, daß der Brennraum (20) die Verbrennungsplatte (18) enthält, deren mittlerer Teil ausgehöhlt ist, wobei der ausgehöhlte Raum (22a) mit dem Verbrennungskatalysator (26) gefüllt ist.

6. Reformer nach einem der vorhergehenden Ansprüche, dadurch **gekennzeichnet**, daß die Hilfseinheit (II) eine Distanzplatte (30) enthält, die einen ausgenommenen Raum (28) hat, der als Kraftstoffvorratskammer (28) dient, und daß zwei Dispersionsplatten (34, 34) auf den beiden Seiten der Distanzplatte angeordnet sind, wobei eine Vielzahl von Poren in der Dispersionsplatte (34) vorgesehen ist, so daß Kraftstoff durch sie hindurch von der Kraftstoffkammer (28) zu dem Brennraum der benachbarten Haupteinh it (I) geliefert wird.

7. Reform r nach Anspruch 6, dadurch **gekennzeichnet**, daß die Haupteinheit (I) derart gestap lt ist, daß ihr Brennraum (20) nah der Dispersionsplatte (34) angeordnet ist, und daß in Halter (10, 12) auf der dem Reformierr aktor (16) zugewandten Seite der Haupt inh it (I) befestigt ist, so daß all Einheiten (I, II, I) als eine einzige Einheit zusammengefaßt sind.

8. Reformer nach Anspruch 7, dadurch **gekennzeichnet**, daß der Eintritt (36) für das Vormaterialgas und der Austritt (38) für das reformierte Gas in einem Halter (10) ausgebildet sind, und daß Zuführ- und Abführkanäle (40, 42) für das zu reformierende Vormaterialgas und für das reformierte Gas in der wärmeleitfähigen Teilungswand (22), in der Verbrennungsplatte (18), in der Distanzplatte (30) und in der Dispersionsplatte (34) der Hilfseinheit (II) ausgebildet sind.

9. Reformer nach Anspruch 7, dadurch **gekennzeichnet**, daß die Eintrittsöffnungen (44, 46) für die Verbrennungsluft und das Brennstoffgas und die Austrittsöffnung (48) für das verbrannte Gas in dem anderen Halter (12) ausgebildet sind, daß ein Zuführungskanal (50) für Verbrennungsluft und ein Abführungskanal (54) für das Abgas in der wärmeleitfähigen Teilungswand (22), in der Reformierplatte (14), in der Distanzplatte (30) und in der Dispersionsplatte (34) der Hilfseinheit (II) ausgebildet sind, und daß ein Zuführungskanal (52) in der Verbrennungsplatte (18), in der wärmeleitfähigen Teilungswand (22), in der Reformierplatte (14) und in der Dispersionsplatte (34) der Hilfseinheit (II) ausgebildet ist, so daß das Kraftstoffgas in den ausgenommenen Raum (28) des Distanzplatte (30) einströmen kann.

10. Reformer nach Anspruch 6, dadurch **gekennzeichnet**, daß eine poröse Platte (60) an der dem Brennraum (20) zugewandten Seite der Dispersionsplatte (34) in der Hilfseinheit (II) vorgesehen ist.

FIG.1

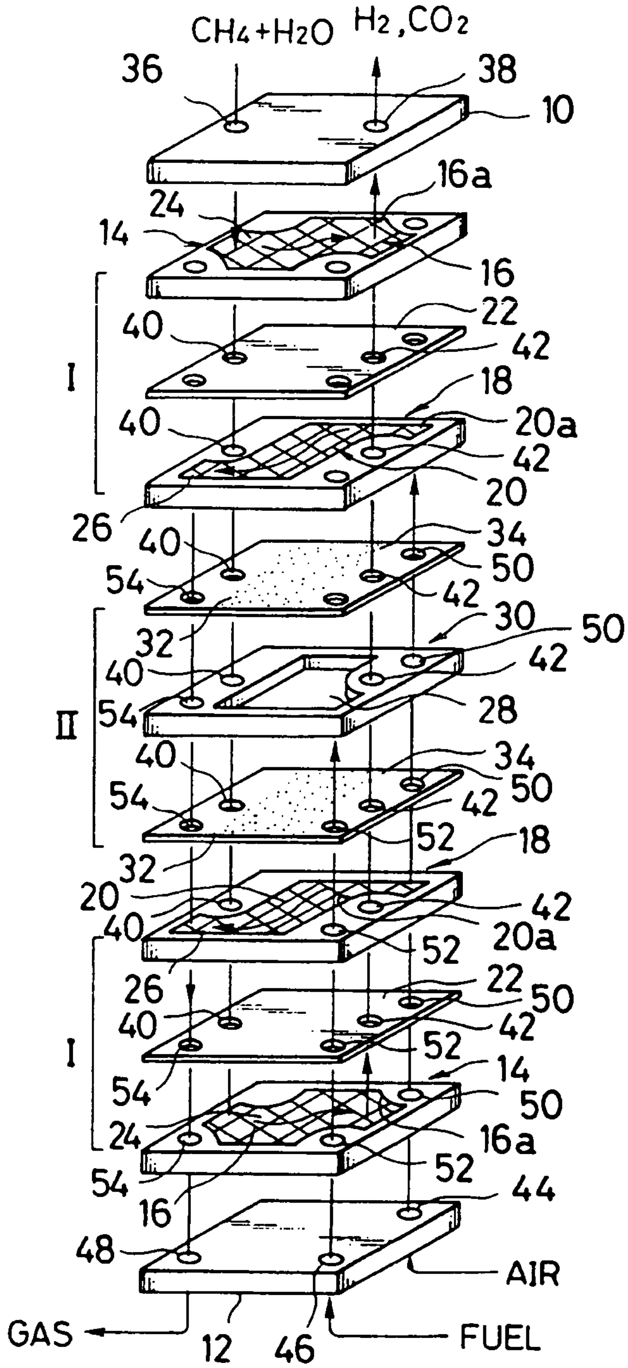

CH_4+H_2O
H_2,CO_2
36
38
10
16a
24
14
16
I
40
22
42
18
40
20a
42
20
26
40
34
54
50
42
30
50
32
40
42
II
54
28
40
34
54
50
42
52
32
18
20
42
40
20a
52
26
22
40
50
42
I
52
54
14
24
50
16a
54
52
16
44
48
AIR
GAS
12
46
FUEL

FIG.2

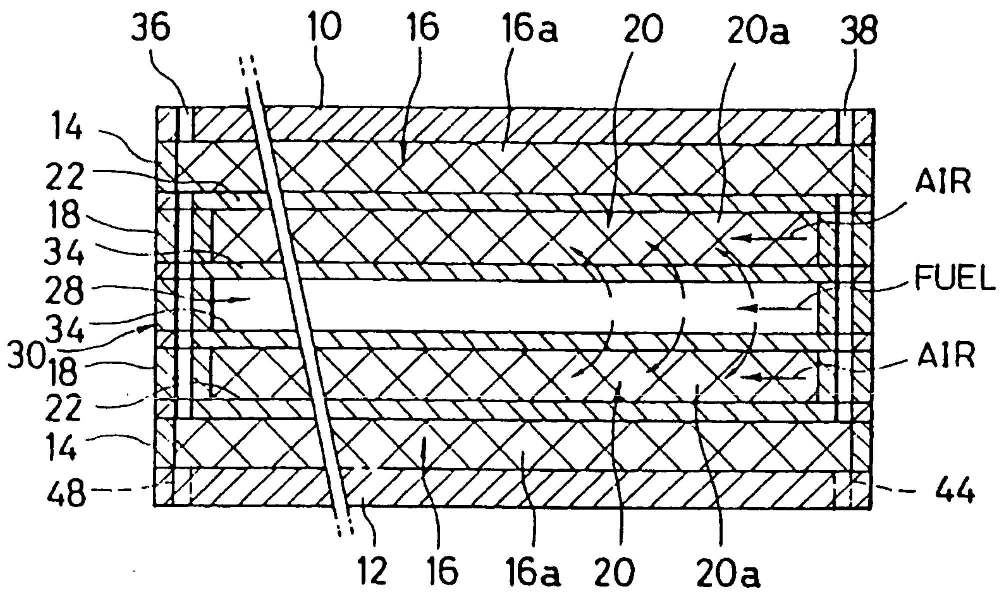

36
10
16
16a
20
20a
38
14
22
18
34
28
34
30
18
22
14
48
AIR
FUEL
AIR
44
12
16
16a
20
20a

FIG.3

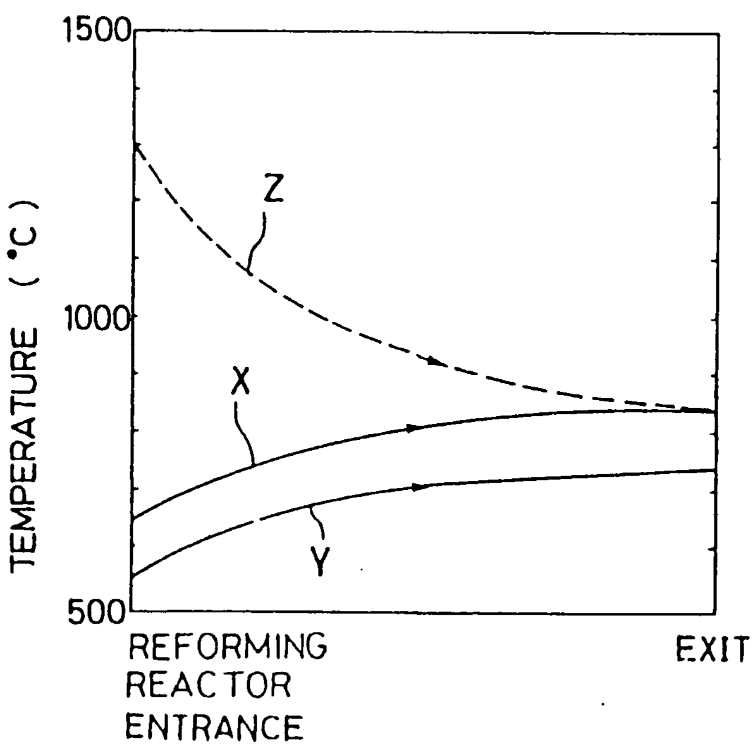

1500
1000
500
TEMPERATURE (°C)
Z
X
Y
REFORMING REACTOR ENTRANCE
EXIT

FIG.4

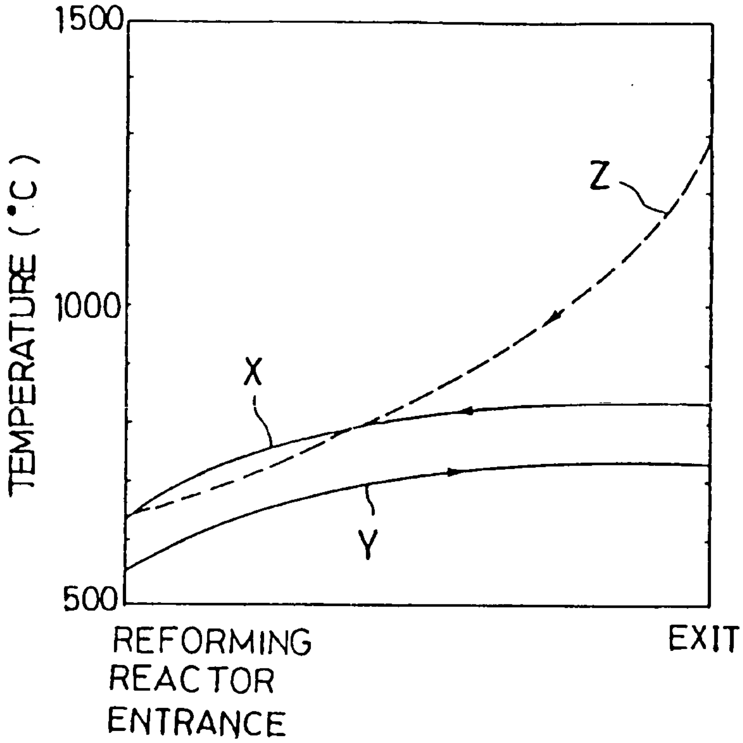
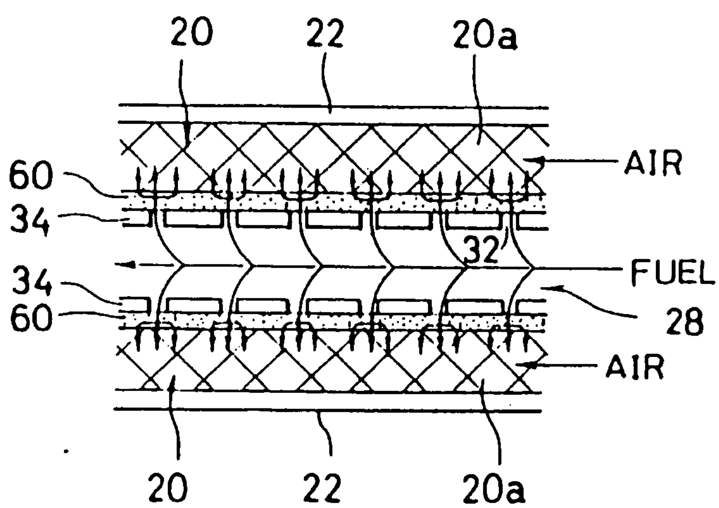

1500
1000
500
TEMPERATURE (°C)
Z
X
Y
REFORMING
REACTOR
ENTRANCE
EXIT

FIG.5


20
22
20a
60
34
AIR
32
FUEL
34
60
28
AIR
20
22
20a